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PHYSIOLOGICAL AND BIOCHEMICAL EFFECT OF POTASH ON GROWTH AND GROWTH PARAMETERS OF GROUNDNUT IN KHURDA DIST.OF ODISHA

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ABSTRACT

Potash is a Macronutrient which is a major growth, nutrient of Plants and enlisted in the Periodic Table. Here the Young Researchers of Dept. of Plant Physiology, College of Agriculture, Bhubaneswar have made a great interest in the ignited mind to know the Physiological and Biochemical Effect of Potash on Growth and Growth Parameters of Groundnut Crop in Khurda Dist. Of Odisha. The climate and soil suitability are as per the Coastal Odisha Condition. This Experiment was conducted in the Year 2014-15 under the supervision of a Plant Physiologist in the association with Dept. Of Agronomy.

KEYWORDS: Macronutrient, Physiological and Biochemical, & Coastal Odisha Condition

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Original Article

INTRODUCTION

Groundnut is a Cash Crop in Odisha and also a major Oil Seed Crop consumed everywhere. Usually Ground Nut growth depends upon the application of Major Macro Nutrients like N-P-K. Potash content is helping in the vegetative growth.

In India and Odisha in particular groundnut is largely grown under rain-fed conditions and its production depends on quantity of rainfall and its distribution that are usually unpredictable. Groundnut yield in rain-fed areas has been limited by drought stress because the pod yield and other growth parameters are severely affected**.** The water stress may affect the crop at different growth stages of crops such as vegetative, flowering and pod filling stages which are considered most critical for vegetative growth, pod formation and pod filling and result in drastic reduction in crop yield.

Here Khurda Dist which is a Coastal Dist. In the Eastern Region is acting as a Leading Dist. To Produce Groundnut. OUAT is the Host University to make vivid research to transfer the Technology to Farmers by implementing the Scheme on "AICRIP on Groundnut" funded by ICAR. The research has been made for testing the Physiological and Biochemical effect of Potash on Growth of groundnut.

MATERIALS AND METHODS

The Research was conducted at Dept. of Agronomy at the Scheme of ICAR-AICRIP on Groundnut in association with Dept. of Plant Physiology. Here the Researchers were using Randomized Block Design (RBD) to get the effective result. The Field Level Intercultural operations and applications of various inputs were executed

strictly by following the Farm Plan and Crop Calendar. With the highly qualified Plant Physiologist and Agronomist minute observations were recorded for concrete research. Finally a technology was invented for farmer friends and researchers regarding the effect of potash with major oilseed crops like Groundnut in coastal condition.

RESULT AND DISCUSSIONS

Growth and Morphological Traits

Plant Height, Number of Branches and Number of Leaves Per Plant

Plant height, number of branches and leaves per plant recorded in 30, 45 and 60 DAS were presented in table 1. Increase in plant height, branches and leaves per plant were observed with the advancement of growth from 30 to 60 DAS. Higher increment in plant height, branches and the number of leaves per plant was noticed in all the treatments during 45 to 60 DAS as compared to increase during 30 to 45 DAS.

Variation in plant height was found between the treatments at each growth stage. The minimum plant height was recorded in control at all the stages of growth and maximum plant height was recorded in T_7 at 30 DAS whereas height was maximum in T_8 (16.3 and 28.2 cm) at 45 and 60 DAS respectively. Significant increase in height was recorded in plants supplied with 150 and 200% of the recommended dose of potash, which applied in split at sowing and flowering stage of the crop.

Branches per plant varied among the treatments. Minimum number of branches per plant were recorded in control and maximum branches per plant were found in T_8. Significant increase in the number of branches over control occurred in plants supplied with potash at the rate of 150 and 200% of recommended dose which applied in split at sowing and flowering stage of the crop.

Leaves per plant recorded at each growth stages varied among the treatments. The lowest number of leaves was noticed in the control (no potash) plants and the highest number of leaves (36, 43 and 70 at 30, 45 and 60 DAS respectively) was found in plants supplied with potash at the rate of 80 kg/ha in two splits (T_8). Significant increase in leaf number was noticed in plants supplied with potash in a split at the rate of 60 kg/ha (T_7) and 80 kg/ha (T_8) over control (T_1).

Table 1: Effect of Levels and Time of Potash Application on Plant Height, Number of Branches and Number of Leaves Per Plant

Treatments	Plant Height(Cm)			No.of Branches/Plant			No. of Leaves/ Plant		
	30 DAS	45 DAS	60 DAS	30 DAS	45 DAS	60 DAS	30 DAS	45 DAS	60 DAS
T_1	8.8	12.4	24.3	4	5	6	27.5	34.5	42.3
T_2	9.6	13.0	26.0	5	5	6	28.4	35.3	47.2
T_3	11.0	13.5	26.5	5	5	7	29.5	37.6	52.1
T_4	12.1	14.7	26.9	5	6	7	31.4	38.5	55.2
T_5	12.6	15.2	27.3	5	7	8	32.4	40.5	61.8
T_6	11.8	14.0	26.5	5	7	8	32.4	41.2	52.1
T_7	13.7	15.5	27.4	5	7	8	35.7	42.5	62.2
T_8	13.5	16.3	28.2	5	8	8	36.2	42.5	69.8
SEM	1.37	0.53	1.23	0.30	0.30	0.31	1.73	2.94	5.45
CD 5%	4.1	1.6	3.7	0.91	0.92	0.94	5.2	8.8	16.3

TDM and Nodules Per Plant

Total dry matter (TDM) and nodules per plant recorded in 30, 45 and 60 DAS were depicted in table-2. The result revealed that TDM and nodules per plant increased with increase in age of the plant from 30 to 60 DAS in all the

treatments.

Accumulation of TDM in plant varied among the treatments at all the three stages of plant growth. The lowest accumulates of dry matter was recorded in plants grown without potash (T_1) and the highest accumulation 14.6, 38.42 and 47.37 g/plants in 30,45 and 60 DAS respectively under application of 80kg K/ha in splits at sowing and flowering (T_8). Significant increase in TDM was noticed in plants grown under the higher rate 60kg K/ha (T_7) and 80kg K/ha (T_8) applied in split doses. The accumulation of TDM was better under split application of potash than its single application at sowing. More accumulation of TDM was noticed at an early stage between 30 and 45 DAS than latter stage between 45 and 60 DAS in plants grown under higher dose of potash as compared to plants grown at lower dose of potash application.

Nodules per plant differed among the treatments at all the three stages. The lowest number of nodules per plant was recorded in control plants without potash application (T_1) and the highest number of nodules 39.3, 88.3 and 107.9 per plant was recorded in 30, 45 and 60 DAS respectively under application of 60 kg K/ha in split doses during sowing and flowering. (T_7). Significant increase in nodules per plant over control was observed in plants grown under the higher rate of K up to 60kg /ha but beyond this level no significant difference was found pertaining to the formation of nodules in plants. Split application of K not only produced more nodules in plant than its single application at sowing, but also induced formation of more number of nodules in plants at an early stage between 30 and 45 DAS compared to 45 and 60 DAS.

HYSIOLOGICAL TRAITS

LAI and LAD

Leaf area index (LAI) recorded in 30, 45 and 60 DAS and leaf area duration (LAD) between 60 and 75 DAS (Table-3) indicated that there was a concomitant increase in LA

Table 2: Effect of Levels and Time of Potash Application on Total Dry Matter and Number of Nodules Per Plant

Treatments	TDM (G/Plant)			No. of Nodules/Plant		
	30 DAS	45 DAS	60 DAS	30 DAS	45 DAS	60 DAS
T_1	11.37	18.53	32.17	12.6	38.6	61.0
T_2	11.69	20.13	33.77	20.4	47.2	82.0
T_3	11.96	23.82	37.47	22.8	47.9	87.4
T_4	13.1	29.37	38.37	26.5	56.1	89.0
T_5	13.7	35.34	44.56	27.2	65.8	92.6
T_6	12.69	31.33	44.65	24.4	55.2	93.1
T_7	11.96	38.42	47.29	39.3	88.3	107.9
T_8	14.6	38.42	47.37	36.9	87.8	104.8
SEM	0.77	5.18	2.75	3.87	4.108	10.53
CD 5%	2.31	15.51	8.23	11.6	12.46	31.5

Table 3: Effect of Levels and Time of Potash Application on Leaf Area Index (LAI) and leaf Area Duration (LAD)

Treatments	(LAI)			(LAD)
	30 DAS	45 DAS	60 DAS	60-75 DAS
T_1	0.982	1.499	3.316	64.47

Table 3: Contd.,				
T_2	0.989	1.560	3.450	66.58
T_3	1.007	1.585	3.523	67.95
T_4	1.112	1.646	3.657	71.535
T_5	1.214	1.682	3.730	74.16
T_6	1.300	1.621	3.584	73.26
T_7	1.398	1.707	3.791	77.835
T_8	1.412	1.743	3.864	79.14
SEM	0.069	0.067	0.143	3.207
CD (5%)	0.210	0.201	0.43	9.59

DISCUSIONS

The investigation was undertaken in field condition during rabi 2014-15 to study the effect of potash on growth, yield and drought tolerance in groundnut crop. The data relating to various morpho-physiological and biochemical characters studied during the course of the investigation and interpreted on the preceding chapter were discussed in this chapter under these following heads.

GROWTH AND MORPHOLOGICAL TRAITS

Plant Height, Number of Branches and Number of Leaves Per Plant

After application of Potash in Groundnut Crop the Growth of Root, Leaf, Shoots were recorded for getting best result and morphological characters were recorded.

It was revealed that, growth in height, number of branches and leaves was more between 45 and 60 DAS as compared to between 30 and 45 DAS. Potash levels and its time of application increased the plant height over control, but significant, increase was registered with the application of 80kg K/ha in two splits. Improvement in plant height by K application also reported by Sharma *et al* (1996) and pradyut*et al* (2006) which is in agreement with the present result.

Branching in groundnut plant increased till 60 DAS and timing of potash application. The highest numbers of branches per plant were recorded in T_8 during all the stages of growth, which did not differ significantly from T_7 where 60 kg K was applied in two split doses.

A gradual increase in the number of leaves per plant was observed from 30-60 DAS. Leaves per plant were highly influenced by the level and time of potash application to the crop. Though significantly the highest leaf number was recorded when the plants were applied with 80 kg K/ha in splits, but it didn't differ significantly from the application of 60kg K/ha (T_7). K fertilization is associated with increasing crop growth because of the positive effect of this nutrient in osmotic adjustment, stomatal regulation, photosynthesis and protein synthesis, which manifested through improvement in formation of different morphological organs such as branches and leaves.

Increased number of branches per plant due to increased application of K fertilizer as reported by Ali and Mowafy (2003) and Mohammad and Gobrah (2005) corroborated the present findings.

TDM and Nodules Per Plant

Dry matter accumulation and number of nodules produced in plant (table-2) indicated that the dry matter accumulation and nodule formation influenced significantly by the level and time of K application to groundnut crop. Data indicated that there was more accumulation of TDM at an early stage with the application of higher rate of K as compared to low application of potash. Almost similar trend was also noticed in respect of the number of nodules produced

per plant at different growth stages.

Dry matter accumulation in plant varied significantly by level and timing of K application. The highest TDM 14.6,38.4 and 47.4 g/plant was recorded in 30,45 and 60 DAS respectively in plants supplied with 80 kg K/ha in two splits (T_8) but there was no significant difference was found between 60 kg K/ha (T_7) and T_8 with respect to TDM accumulation per plant.

Number of nodules produced per plant at different growth stages also influenced by the levels and timing of K application (table-2). The highest number of nodules 39.3,88.3 and 107.9 per plant were detected in 30,45 and 60 DAS respectively by application of 60 kg K/ha in split doses (T_7) beyond this level no significant difference in nodules per plant was found. Split application of K not only produced more number of nodules in plants, but also induced early formation of nodules as compared to a single application of K. Unlike N and P, K doesn't enter into the composition of any organic molecule, but it has an important role either direct or indirect in major plant processes such as photosynthesis, respiration, protein synthesis, CHO metabolism and building resistance in plant against pest and diseases thus resulting improvement in growth by accelerating the accumulation of dry matter in plant. Increased dry matter accumulation due to increase in K application in groundnut crop has been reported by Pradyut*et al* (2006) and Sharma *et al* (1996) corroborated the present result.

SUMMERY AND CONCLUSIONS

A field experiment was conducted to study the effect of potash on growth, yield and drought tolerance in groundnut during rabi-summer season 2014-2015 at the central farm under AICRP on groundnut, Department of Agronomy, Central farm, OUAT, Bhubaneswar and the physiological studies were carried out in Department of Plant physiology.

A perusal of findings of the present experiment revealed following the trend.

Height of groundnut plant was influenced by the level and timing of its application as recorded at different stages of plant growth. Among the treatments the minimum and maximum height of the plant was observed in T1 and T8 respectively. An increase in the level of K increased the plant height, but significant, increase was noticed in T7 and T8 where K was applied at 60 and 80 kg/ha respectively in two splits.

Number of branches in the plant increased with an increase in the level of K application. The highest number of branches was found in T8 followed by T7 at all the growth stages. Split application of K at the rate of 60 and 80 kg/ha significantly increased number of branches/plant over the control.

Number of leaves per plant were influenced by the level and timing of K application as recorded at various growth stages. The lowest and highest numbers of leaves were noticed in the control (T1) and T8 respectively. Leaf number in the plant increased with an increase in the level of K but significant increase was observed in plants supplied with K in splits at the rate of 60 kg/ha (T7) and 80 kg/ha (T8) over control. Split application of K produced more leaves in the plant compared to its single application.

CONCLUSIONS

Here the Researchers are able to observe the comparative result of both Biochemical and Physiological effect of micronutrient on groundnut crop. The farmers may able to get the latest technology. In view of the positive and beneficial

effect of K application on growth, yield and the drought tolerance ability of groundnut crop, it may be concluded that improvement in the productivity of groundnut crop under low soil moisture or residual soil moisture condition can be possible through increased application of K up to 80 kg/ha in split at sowing and flowering.

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